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THE USE OF A. C. CURRENT WELDING

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A TRIP through any of the Le Tourneau plants, whether it be day or night, will be continuously escorted by the flickering light of electric arcs in action.

Walking through the Peoria plant a glance upward would reveal two 100 foot span arc-welded cranes. Looking to the right or left one would see oxyacetylene camographs and large presses preparing steel sections and plates for eventual arc fabrication. One might even smile to see these sections conveyed away in all arc-welded steel bins to the large arc fabricated steel warehouse or new factory building, and there handled efficiently by the welded jib cranes. This briefly portrays only a small number of welded applications that are the tools for manufacturing all arc-welded earth-moving equipment.

To meet the requirements of our production schedule an average of 1,500,000 pounds of electrode are consumed annually, and over three-hundred single operator type welding machines used in our production departments.

Arc welding, being our principal fabricating process, necessitates a most vigilant control of the many factors that go to make up the final cost of a completed piece of equipment. Because of the growing interest in applying AC welding current to production welding, this paper is confined to its application in the Le Tourneau plants.

Our inventory at the end of 1934 showed a total of 40 machines, all of which were DC current motor-gen-

Fig. 1. Scraper Gooseneck completely welded in powered fixture with AC current.

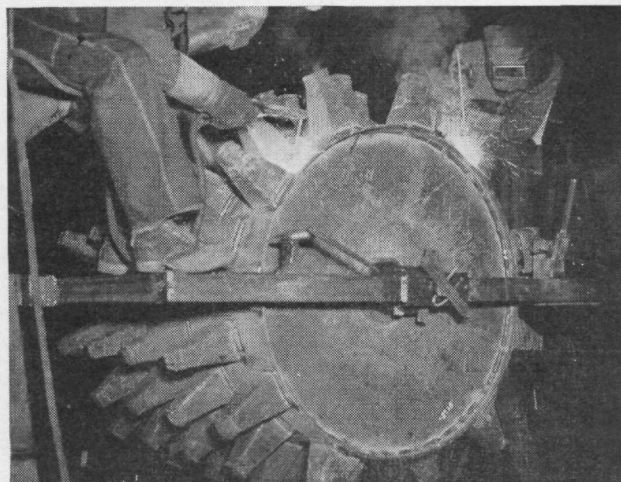
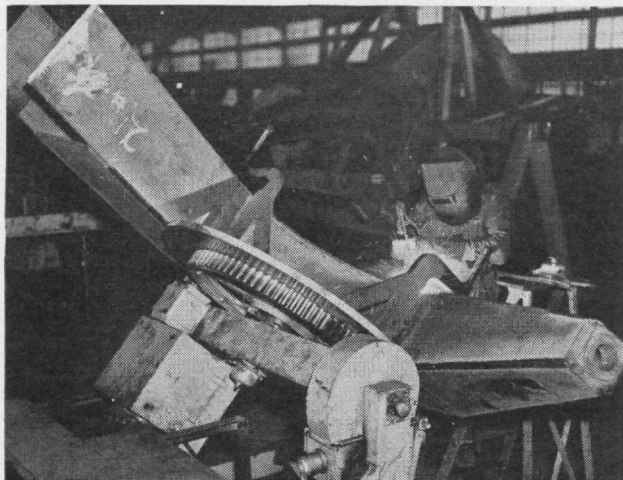


Fig. 2. Sheepsfoot Roller in positioning fixture for economical AC welding.

erator types. At the present, with over 300 machines in service, 85% of them are of the AC current type. The obsolescence of DC current for our production welding began early in 1935, during an expansion period. With a program laid out that would increase our welding operations tremendously, more equipment had to be purchased and at that time both DC and AC machines of several different makes were installed for test purposes.

Comparative tests were made to determine the following factors with each machine.

I—Cost to Deposit Per Pound of Weld Metal.

- (a) A deposition test properly set up and conducted made possible cost data for each machine to deposit a given amount of weld metal. The total cost arrived at included labor, power and electrode.

II—Adaptability of Welding Equipment to Production Work.

Our products include practically every type of welded joint economically recognized. Since 95% of them are positioned for down-hand welding (see figure No. 1-2) it is possible to use more current and increase welding speeds. Comparative tests with DC and AC current on actual applications, brought out distinct advantages of AC current over DC.

AS A UNIVERSAL TOOL

Photographs, Courtesy R. G. Le Tourneau, Inc.

- (a) Complete elimination of arc-blow, which reduced both spatter and undercut.
- (b) Higher welding speeds were possible with AC current, since 25% more current could be applied to electrode without lowering its efficiency.

AC current proved to be further advantageous when applied to our larger structures (figure No. 3). With DC current it was frequently necessary for operators to change their ground leads from one position to another to eliminate arc-blow conditions. Our present AC ground leads are permanently attached to the welding fixture, thereby eliminating unnecessary loss of time.

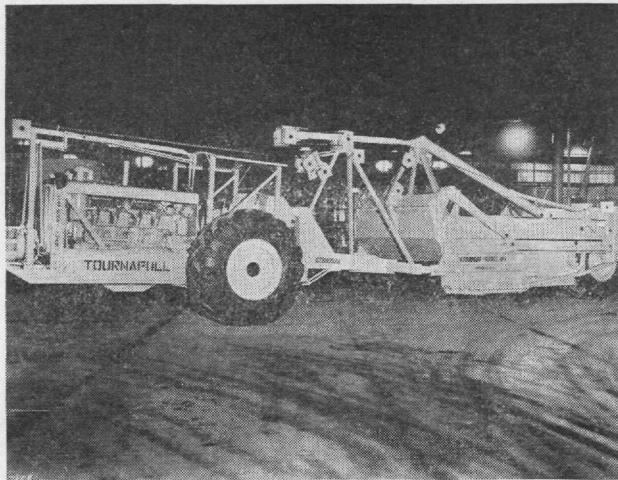


Fig. 3. Tournapull Tractor and 30 cubic yard "Carry-all" scraper ready for shipment, represents variety of welded joints and positions.

A summary of the results of all tests conducted on the two types of welding current showed AC current as the more economical process to adopt for our welding.

Up until the latter part of 1939 our AC welding experience had been confined to 60 cycle transformer type welders. The introduction of high-frequency AC welding current into our plants has resulted in considerable savings over our 60 cycle equipment, and at the present time, 150 high-frequency AC motor-generator units are being installed to replace our 60 cycle equipment.

Tests run with 180 cycle AC welding current against 60 cycle current resulted in the following findings:

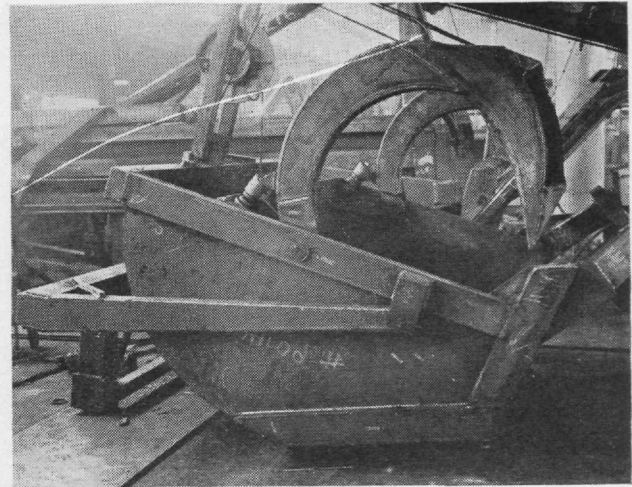


Fig. 4. Small six cubic yard scraper nearing completion.

- (1)—Greater arc stability,
- (2)—Higher quality of weld metal,
- (3)—More feet of welding per hour,
- (4)—Less spatter loss.

Actual application of high-frequency current on our production welding has lowered welding costs in some cases as much as 50%.

Using welding costs as a gauge for determining the performance of one type of welding current over another, we have repeatedly found that on our work AC current is more economical, and have equipped our plants accordingly.

There is a general opinion that AC current is best applied where deep-groove welding and long welds are encountered. It is also generally conceded that AC current is not successfully adapted to vertical and overhead welding. With the proper training of operators we have found that AC current can be applied economically to any type of welding in any position, with the exception of certain alloys and cast-iron, for which electrodes have been developed to operate on DC current only.

Fig. 5. Arc fabricated reduction gears. Magnetic blow conditions encountered, make use of AC current necessary.

